Unusual nanostructured ZnO particles from an ionic liquid precursor (ILP)

Zhonghao Li,[a]* Yuxia Luan,*[b] Tiancheng Mu*[c]

Corresponding author: School of materials science and engineering, Shandong University, Jinan, Shandong Province, 250061, P. R. China. Email: zhonghaoli@sdu.edu.cn. Fax: (86) 531-88392315, Tel. (86) 531-88392112

a School of materials science and engineering, Shandong University

b School of pharmaceutical sciences, Shandong University

c Department of chemistry, Renmin University of China

Experimental section

Synthesis. In a typical experiment, 10 to 60 mg zinc acetate dihydrate were dissolved in 1 g of tetrabutyl ammonium hydroxide (TBAH, $N(C_4H_9)_4OH{\cdot}30\ H_2O$, m.p. 26 – 28 ºC) in a flask with 5 ml and the mixture was warmed up to 30 °C for a few minutes until the solution was clear. Then the samples were heated to 80 ^oC for 20 h in air. The resulting white solid was recovered via centrifugation, washing with water and ethanol, and drying at 60 ºC.

Photocatalytic activity experiments. In the photocatalytic activity experiments, 30 mg of ZnO particles was added into 50 mL of Rhodamine B solution (1.5×10^{-5} mol/L), and the mixture was magnetically stirred in the dark for 30 min to ensure the adsorption/desorption equilibrium of dyes with the ZnO particles, followed by exposure to a 120W mercury lamp. The reaction mixture was stirred under UV irradiation. After the reaction, the mixture was sampled at different times and centrifuged for 5 min to discard any sediment. It was monitored through a wavelength scan on a 2102 UV–vis spectrophotometer. Then, absorption spectra were obtained. Commercial ZnO particles (about 100-300 nm) were used for the comparing experiment.

Characterization. X-ray diffraction was done on a Nonius PDS 120 with CuK□ radiation and position sensitive detector. SEM was done on a Philips XL-30 ESEM operated at 10 kV. Samples were sputtered with Au prior to imaging. Nitrogen

sorption experiments (BET) were made on a Micromeritics Tristar 3000 automated gas adsorption analyzer. Room temperature photoluminescence spectra were recorded with a Jobin Yvon FluoroMax 3. UV–vis absorption was monitored with a 2102 UV–vis spectrophotometer.

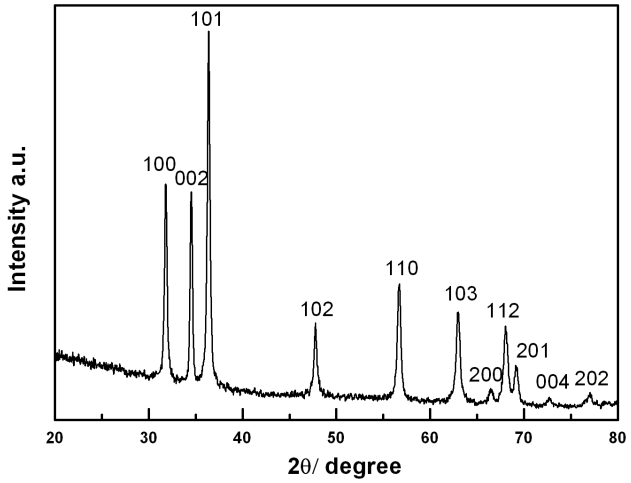

Figure S1. XRD pattern of a sample precipitated with 35 mg of zinc acetate dihydrate in 1 g TBAH ionic liquid.

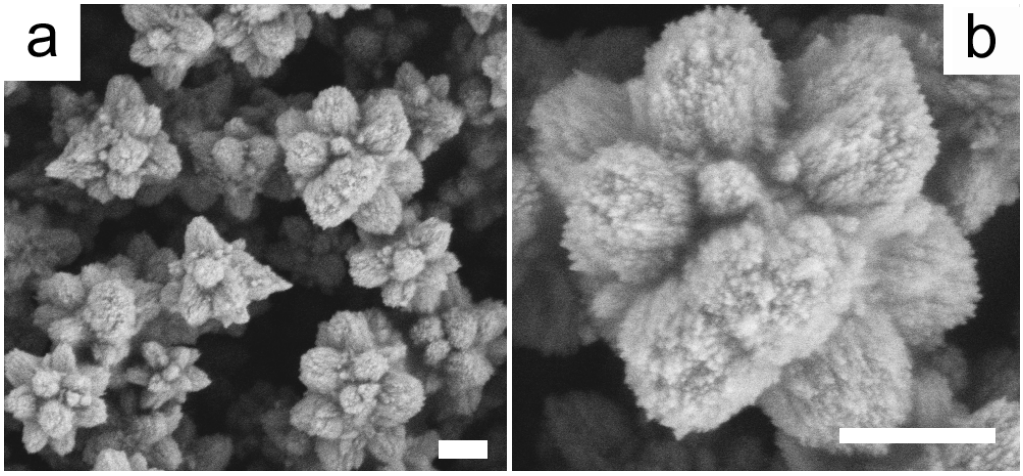

Figure S2. SEM image of a sample precipitated with 35 mg of zinc acetate dihydrate in 1 g TBAH ionic liquid after 30s of reaction. (a) low magnification, (b) high magnification. Scale bars are 500 nm.

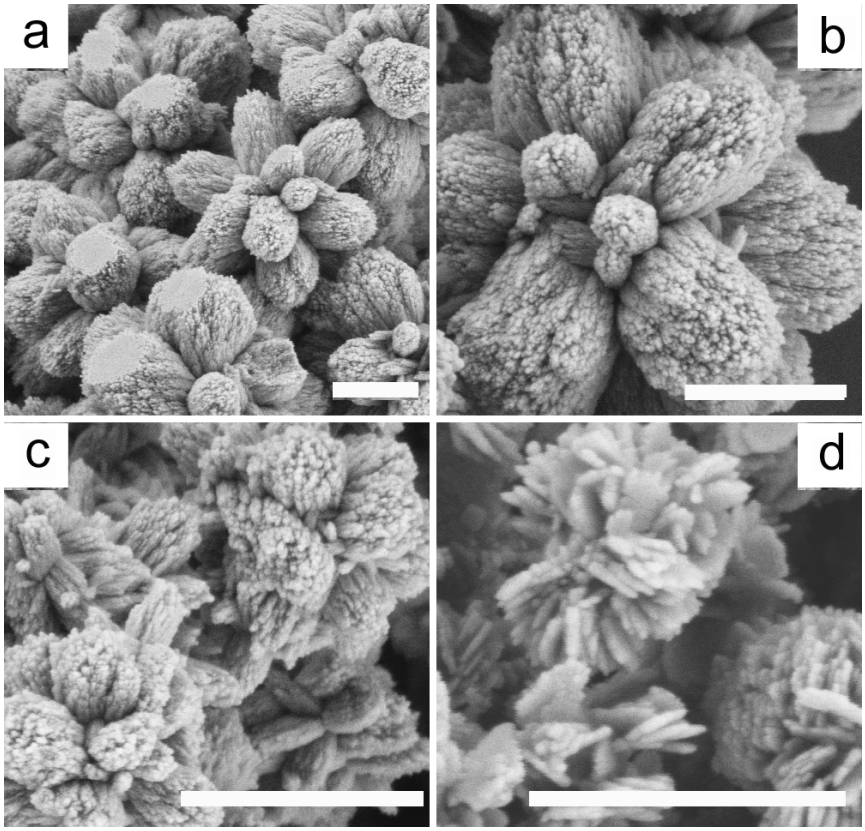

Figure S3. Low and high magnification SEM images of samples precipitated at different Zinc acetate dihydrate concentrations: (a, b) 40, (c) 50, and (d) 60 mg of zinc acetate dihydrate. Scale bars are 1μm .

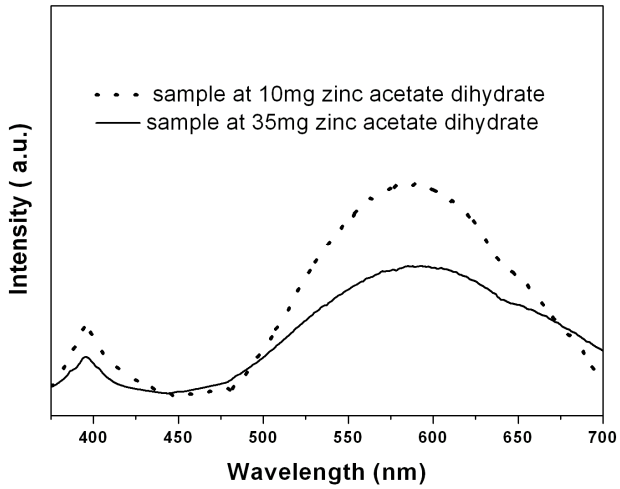

Figure S4. Room-temperature photoluminescence spectra for the samples prepared at 10 mg and 35 mg zinc acetate dihydrate in 1g TBAH.

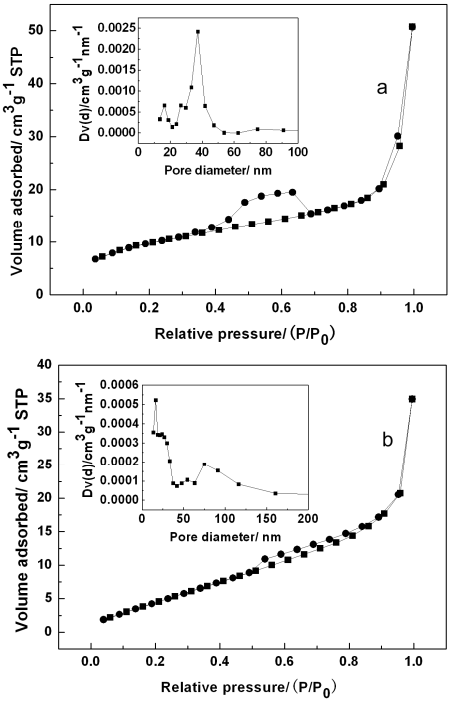

Figure S5. Nitrogen adsorption/desorption isotherm and Barrett-Joyner-Halenda (BJH) pore size distribution plot (inset) for samples prepared at 10 (a) and 35 mg (b) of zinc acetate dihydrate in 1g TBAH, respectively.

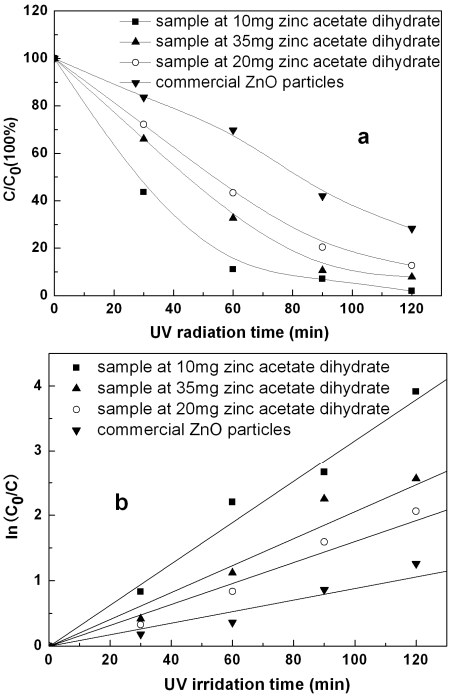

Figure S6. The residual concentration (a) and relative absorbance (b) of Rhodamine B dye in aqueous solutions after different UV irritation times in the presence of samples prepared at 10 mg, 35 mg, 20 mg zinc acetate dihydrate in 1g TBAH and the commercial ZnO particles. C_0 and C are the equilibrium concentration of RhB before and after UV irradiation, respectively)